2016

Aprepitant

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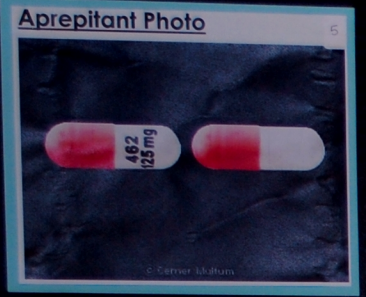
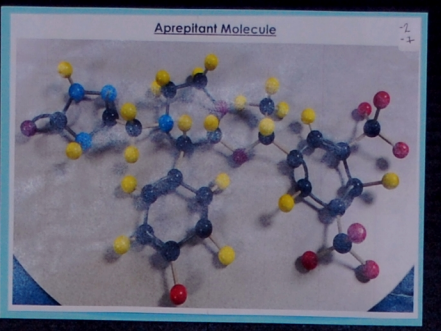
APREPITANT

Aprepitant Photo



Aprepitant Molecule



Chemical Formula

$C_{23}H_{21}F_7N_4O_3$ 2

Generic Name

Aprepitant 1

Trade Name

Emend 1

Chemical Name

5-[[(2R,3S)-2-[(1R)-1-[3,5-Bis(trifluoromethyl)phenyl]ethoxy]-3-(4-fluorophenyl)-4-morpholinyl]methyl]-1,2-dihydro-3*H*-1,2,4-triazol-3-one; (2R)-[(1R)-3,5-bis(trifluoromethyl)phenylethoxy]-(3S)-(4-fluoro)phenyl-4-(3-oxo-1,2,4-triazol-5-yl)methylmorpholine; MK-0869; Emend. 2

Water Solubility Literature Value

- Experimental Properties

Water Solubility - Practically Insoluble

- Predicted Properties:

Water Solubility – 0.0194 mg/mL 3

Classification

Central Acting Antiemetic; Substance P/ Neurokinin 1 (NK_1) Receptor Antagonist 1

How does the body take Aprepitant in?

- The medicine is administered orally one hour prior to starting the chemotherapy session.
- After taking the oral dose, 60-65% of it reaches systemic circulation. 1

Calculating Molar Mass

Formula: $C_{23}H_{21}F_7N_4O_3$

C - 12.01g (23) = 276.23g

H - 1.00g (21) = 21.00g

F - 19.00g (7) = 133.00g

N – 14.00g (4) = 56.00g

O - 16.00g (3) = 48.00g

276.23g + 21.00g +133.00g + 56.00g + 48.00g = 534.23g

Final Answer:

The molar mass of Aprepitant is 534.23g 6

Water Solubility Literature Value After Converting g/100mL

- Experimental Properties: No value shown in drugbank.ca
- Predicted Properties:

$$\frac{0.0194\text{ mg}}{1\text{ mL}} \times \frac{1\text{ g}}{1000\text{ mg}} = \frac{0.0000194\text{ g}}{1\text{ mL}} \times \frac{100\text{ mL}}{100\text{ mL}} = \frac{0.00194\text{ g}}{100\text{ mL}}$$ 3

Uses

Aprepitant (Emend) is used to prevent acute and delayed nausea and vomiting associated with emetogenic chemotherapy. 1

What does the body do with Aprepitant after it has been absorbed?

- The Substance P and NK-1 receptor areas control the emetic reflex which is what controls vomiting.
- Aprepitant is selective and after it crosses the blood barriers, it inhabits the NK-1 receptors. Thus, it prevents any nausea or vomiting that might occur as a result of chemotherapy. 1

Literature Value for the Molar Mass

mol wt – 534.43g 2

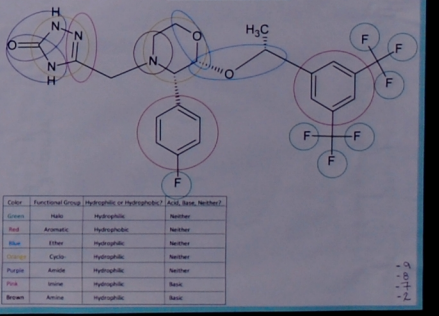
Water Solubility

Insoluble 3

AVAILABILITY 4

- Aprepitant is available in capsules of 40 mg, 80 mg, and 125 mg.
- The powder for injections is available in 125 mg.

Condensed Structure



Color	Functional Group	Hydrophilic or Hydrophobic?	Acid, Base, Neither?
Green	Halo	Hydrophilic	Neither
Red	Aromatic	Hydrophobic	Neither
Blue	Ether	Hydrophilic	Neither
Orange	Cyclo-	Hydrophilic	Neither
Purple	Amide	Hydrophilic	Neither
Pink	Imine	Hydrophilic	Basic
Brown	Amine	Hydrophilic	Basic

Percentage of Polar Carbons

- Aprepitant has 23 total carbons and 11of those carbons are *polar* carbons.

$$\frac{11\text{ polar carbons}}{23\text{ total carbons}} \times 100 = 48\%\text{ polar carbons in molecule}$$

- I would expect my molecule to be *slightly soluble* because 48% of the carbons are polar and water is polar ("like dissolves like"). 10

Molecules Per 125 mg

Chosen Dose:125 mg = 0.125 g

$$0.125\text{ g} \times \frac{1\text{ mole}}{534.43\text{ g}} = 2.34 \times 10^{-4}\text{ moles}$$

$$2.34 \times 10^{-4}\text{ moles} \times \frac{6.02 \times 10^{23}\text{ molecules}}{1\text{ mole}} = 1.41 \times 10^{20}\text{ molecules}$$

How does the body break down Aprepitant?

CYP3A4 is a drug metabolizing enzyme. Once the body has used Aprepitant, it moves to the liver by CYP3A4. 1

Tablets Per 125 mg

$$125\text{ mg} \times \frac{1\text{ tablet}}{40\text{ mg}} = 3\text{ tablets}$$

How does the body eliminate Aprepitant? 1

Aprepitant is not renally excreted.

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